

## OBITUARY NOTICE

S. H. BURBURY.

SAMUEL HAWKSLEY BURBURY was born at Kenilworth, in 1831, and was educated at Shrewsbury School, whence, like many Salopians of that and later times, he proceeded to St. John's College, Cambridge. His university career was one of great distinction in classical literature; he obtained the Porson Prize for Greek verse, and was Craven Scholar in 1853; and he gained the second place in the Classical Tripos in 1854 and the second Chancellor's Medal. To this he added in the same year the position of fifteenth wrangler in the Mathematical Tripos, thus constituting one of the most brilliant double degrees on record. In due course he became a Fellow of St. John's College and was called to the Bar. After an interval of more than twenty years he revived his mathematical studies under the influence of his friend Dr. H. W. Watson, afterwards F.R.S., who had come under the spell of Clerk Maxwell, and, through his advice and direction, wrote in 1876 (second edition 1893) the earliest systematic dynamical treatise on the Theory of Gases, expounding, in thorough fashion, mainly the work of Maxwell himself and his successor Boltzmann. In the preface Watson mentions his difficulties with Boltzmann's deduction of the second law of thermodynamics, and states his obligation to his friend Burbury for an argument which he considered to be unexceptionable and applicable to all cases. This led to further co-operation; and under their joint names there appeared in 1883-5 a *Treatise on the Mathematical Theory of Electricity*, in two volumes, again concerned mainly with the exposition of Maxwell's electrical ideas, then still on their trial, and not yet fully accepted on the Continent of Europe. This treatise, a very valuable and original one for the time, contained extensive exposition and development of the difficult parts of Maxwell's own classical treatise of 1872, and at the same time incorporated much new mathematical material that had accumulated in the intervening years, with original developments of their own. Mr. Burbury's main original work lay, however, in the Dynamical Theory of Gases, in which at first he communicated memoirs to the *Philosophical Transactions* and the *Philosophical Magazine*, defending Maxwell's law of equable partition of energy among the degrees of freedom of the molecules against the attacks then current, including those of Lord Kelvin, and elucidating it in various directions. In course

of time he became convinced that the simple Maxwellian law of distribution  $e^{-hQ}$ , where  $Q = \Sigma m(u^2 + v^2 + w^2)$ , did not adequately include the interactions of a crowded set of molecules, and that  $Q$  should be replaced by  $Q' = \Sigma m(u^2 + v^2 + w^2) + \Sigma \Sigma b(uu' + vv' + ww')$ ; and he worked out a new gas-theory on this basis in various memoirs which he condensed into *A Treatise on the Kinetic Theory of Gases*, published by the Cambridge University Press in 1899. He remarks that for gases under ordinary conditions the effect of the coefficient  $b$  is probably very small. But in denser gases it leads to local streaming effects, of course on a molecular scale of magnitude, while the equable partition of energy ceases to hold: and he criticizes the more recent developments of Boltzmann's work in that regard. The difficulty of the subject has hitherto prevented many physicists from following him in this very acute piece of work: but signs are not wanting that in the future his train of ideas may be needed in connexion with the modern developments relating to Brownian movements and the physical theory of emulsions. Whether in his own constructive work, or in his trenchant criticism of the work of others, Mr. Burbury's literary gifts always stood revealed in the conciseness and elegance of his modes of expression. For many years he was afflicted by deafness, which limited considerably his sphere of activity; but he retained his vigour, both mental and bodily, and was to the last a very regular attendant at the weekly meetings of the Royal Society, and was closely interested in all branches of physical science. He was elected Fellow of the Royal Society in 1890. He died at the ripe age of 79 years.

J. L.